

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent of:

NGUYEN *et al.*

Patent. No.: 6,972,625 B2

Issued: December 6, 2005

For: **Variable Transconductance Variable
Gain Amplifier Utilizing A
Degenerated Differential Pair**

Confirmation No.: 4381

Art Unit: 2817

Examiner: Michael B. Shingleton

Atty. Docket: 1875.1030004

**Request for Certificate of Correction
Under 37 C.F.R. § 1.322 and 1.323**

Attn: Certificate of Correction Branch

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

It is hereby requested that a Certificate of Correction under 37 C.F.R. §§ 1.322 and 1.323 be issued for the above-captioned United States Patent. This Certificate of Correction is being requested due to mistakes which appear in the printed patent. These mistakes were made by both the U.S. Patent and Trademark Office and by Applicants. The mistakes made by Applicants are of a clerical or typographical nature, or of a minor character. Patentee(s) submit that correction of these errors does not introduce new matter.

Specifically, the printed patent contains the following errors for which a Certificate of Correction is respectfully requested:

In column 47, line 3, the formula shown should end with an ellipsis "..." after the last "+" sign. This correction is requested to correct a typographical error made by the USPTO. A copy of page 90 of the original application as filed on April 14, 2004 is enclosed in support of this correction as Exhibit 1.

In column 50, line 38, the word "ration" should be replaced by - - ratio - - . This correction is requested to correct a typographical error made by Applicants. A copy of page 97 of the original application as filed on April 14, 2004 is enclosed in support of this correction as Exhibit 2.

Remarks

The above-noted corrections do not involve such changes in the patent as would constitute new matter or would require reexamination.

A completed Form PTO/SB/44 accompanies this request, with the above-noted corrections printed thereon. Accordingly, a Certificate of Correction is believed proper and issuance thereof is respectfully requested.

This request is accompanied by payment of the fee set forth in 37 C.F.R. § 1.20(a). Fee payment is provided in the attached Credit Card Payment Form (PTO-2038). The Commissioner is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Virgil L. Beaston
Attorney for Patentees
Registration No. 47,415

Date: 6/30/2006

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

41586/PBH/B600

input signals and begins to distort when large signals are applied.

In filter design the more significant spurious response tends to be third order intermodulation distortion. The following process for minimizing distortion is carried out by considering only intermodulation distortion present in a differential pair amplifier.

For the differential pair of FIG. 31e, third order intermodulation distortion (IM3) is given in equation (7.6).

To calculate IM3, the coefficients in the following equation must first be found:

$$\Delta I_d = a_1 v_i + a_2 v_i^2 + a_3 v_i^3 + a_4 v_i^4 + a_5 v_i^5 + a_6 v_i^6 + \dots \quad (7.3)$$

Where v_i denotes the input voltage.

By comparing equation (7.3) to equation (7.6) the coefficients of equation (7.3) are determined:

$$\begin{aligned} a_1 &= \frac{I_{SS}}{(V_{GS} - V_{th})} & a_2 &= 0 \\ a_3 &= -\frac{I_{SS}}{8(V_{GS} - V_{th})^3} & a_4 &= 0 \\ a_5 &= -\frac{I_{SS}}{128(V_{GS} - V_{th})^5} & a_6 &= 0 \end{aligned} \quad (7.4)$$

The third order intermodulation components IM3, are known to be generated by the odd coefficients. Thus, by collecting the terms having odd coefficients, and defining their sum to be the third

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Assuming that $\frac{V_{gs}^{M1,2}}{V_{gs}^{M3,4}} = m$ and thus $\frac{W^{M1,2}}{W^{M3,4}} = \frac{n}{m^2}$, the total current is found to be:

$$\Delta I_{Total} = I_{ss} \times \left\{ \left(\frac{\Delta V_i}{V_{gs}^{M1,2}} \right) \left(1 - \frac{m}{n} \right) - \frac{1}{8} \left(\frac{\Delta V_i}{V_{gs}^{M1,2}} \right)^3 \left(1 - \frac{m^3}{n} \right) - \frac{1}{128} \left(\frac{\Delta V_i}{V_{gs}^{M1,2}} \right)^5 \left(1 - \frac{m^5}{n} \right) - \frac{1}{1024} \left(\frac{\Delta V_i}{V_{gs}^{M1,2}} \right)^7 \left(1 - \frac{m^7}{n} \right) \dots \right\} \quad (7.14)$$

Where the ration of the channel widths comes from the current sources having a ratio of n, and the v_{gs} s have a ratio of m. Thus, for a MOS transistor operating in saturation:

$$I_{ds} = \frac{\mu C_{ox} W}{2L} (V_{gs} - V_{th})^2 \quad (7.15)$$

$$\frac{I_{ds}^{M1,2}}{I_{ds}^{M3,4}} = \frac{W^{M1,2} (V_{gs} - V_{th})^2}{W^{M3,4} (V_{gs} - V_{th})^2} \quad (7.16)$$

$$- > \frac{W^{M1,2}}{W^{M3,4}} = \frac{n}{m^2} \quad (7.17)$$

The third order term of equation (7.14) that controls the contribution of third order intermodulation goes to zero when $m^3/n = 1$. The cross coupled differential amplifier is described in more detail in P.R. Gray and R.G. Myer, "Analysis and Designs of Analog Integrated Circuit Design," Third Edition, John Wiley

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**

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PATENT NO. : 6,972,625 B2
APPLICATION NO.: 10/823,543
ISSUE DATE : December 6, 2005
INVENTOR(S) : Nguyen et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In column 47, line 3, the formula shown ends with an ellipsis "..." after the last "+" sign.

In column 50, line 38, the word "ration" is replaced by -- ratio --.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue, N.W.
Washington, DC 20005-3934

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.